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VIEWS, NEWS AND INTERVIEWS.

In use on the electric street railway of Biddeford, Me., is a peculiar track tester, based upon an adaptation of the telephone. A man sits in a car and talks continuously into a mouthpiece which is connected electrically with a receiver held by a man in the power house. A break in the conversation shows where the track connections are faulty. Some of the politicians of to-day would fill this place acceptably.

There is a lively war of telephone rates going on in Youngstown, Ohio. The citizens are rejoicing that talk is so cheap, and many are patronizing both companies for the sake of comparison.

Colonel Gardiner C. Sims, of Providence, the well known manufacturer, was elected a delegate to the Indianapolis Convention of hard-money Democrats, but was unable to attend on account of pressing business affairs. Colonel Sims, along with thousands of other level-headed Democrats, will support the Republican candidate to emphasize their disgust with the Chicago platform of repudiation.

Warden Coffin, of the Ohio State Prison, is having difficulty in buying an electric plant to carry out the electrocution law. None of the manufacturers will take an order for such a purpose.—*Pittsburgh Dispatch.*

Good for the manufacturers!

Mr. C. J. H. Woodbury, of the American Bell Telephone Company, Boston, is the secretary of the New England Cotton Manufacturers' Association, which held a very interesting meeting last week. Mr. Frank H. Underwood, of Boston, read a valuable paper on "Power Transmission."

The National Electric Light Association.

TO THE EDITOR OF ELECTRICAL REVIEW:

I beg to advise you that a meeting of manufacturers and central station men, to discuss the possibility of standardizing the incandescent lamp base and socket, has been called for Thursday, October 8, commencing at 10.30 A. M. The meeting will be held in the rooms of the American Institute of Electrical Engineers, which are situated on the 10th floor of the Havemeyer Building, 26 Cortlandt street, corner Church, this city.

I may say that every manufacturer previously advised of the intention to hold a meeting has notified us of their desire to be represented.

FREDERIC NICHOLLS,
President.

New York, Sept. 24.

The gross earnings of the Chicago, Ill., street railway shows an average increase in August of $500 per day, as compared with the same month last year.

Royalties Paid the Western Union.

Under the agreement made between the American Bell Telephone Company and the Western Union Telegraph Company, payments have been made as follows during the years named:

1881	$94,000	1889	$511,000
1882	180,000	1890	575,000
1883	246,000	1891	614,000
1884	354,000	1892	648,000
1885	396,000	1893	690,000
1886	404,000	1894	460,000
1887	433,000	1895	296,284
1888	467,000		
Total			$6,368,284

These payments were not made to the Western Union direct, but to the American Speaking Telephone Company, about two-thirds of the stock of that company being owned by the Western Union company, the balance held by individuals. As is well known, this agreement was brought about by the Western Union retiring from the telephone field and turning over to the American Bell company its patents, chief of which were those of Thomas A. Edison. It will be noticed that the largest payment was made in 1893, and with that of 1896 added, will present the good-sized amount of over six and one half millions of dollars.

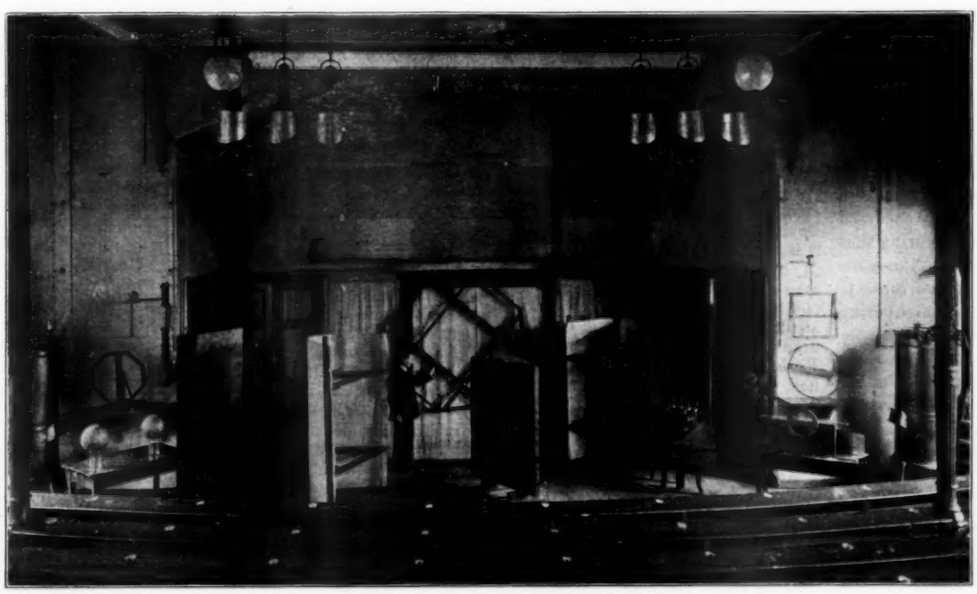
HERTZ'S EXPERIMENTS ON THE ELECTRO-MAGNETIC THEORY OF LIGHT.

BY DR. CHAS. A. PERKINS IN THE "UNIVERSITY SCIENTIFIC MAGAZINE."

The industrial applications of electricity have had an astonishing growth within recent years, but the enlargement of our knowledge of the nature of electricity itself, and its relation with various physical forces, has been no less remarkable.

Faraday was the first to prove the intimate connection between electricity and light, showing that the plane of polarization of light is rotated by an electric current, somewhat as it is rotated when passing through a sugar solution. Faraday further ventured the suggestion that light itself might be an electrical vibration, and that electrical and magnetic forces might be exerted by means of the luminiferous ether, "for it is not at all unlikely that, if there be an ether, it should have other uses than simply the conveyance of radiations." These ideas of Faraday were submitted to mathematical tests by Maxwell, who found them capable of explaining and accounting for the facts, and upon them he based his well known electro-magnetic theory of light.

Every one who has used a telephone is familiar with the fact that when variable electric currents are passing along a wire, currents are thereby set up in the parallel telephone wire. Maxwell showed that if such a disturbance traveled as a wave from one wire to the other through the air, it should travel with the velocity of light.



LECTURE ROOM IN THE TECHNICAL COLLEGE AT CARLSRUHE, WHERE HERTZ PERFORMED HIS EXPERIMENTS.

Maxwell's theory is, in short, that light is itself such a wave of magnetic induction. According to this theory, light is produced by rapidly alternating currents in the luminous body, the direction of the currents being reversed about 1,000,000,000,000,000 times per second. Several of the optical properties of bodies can be explained by this theory, especially the extreme opacity of metals, and so strong was the evidence in its favor that the theory was considered by scientists to be highly probable, even in the absence of direct experimental proof. Indeed, currents of such a high rate of alternation are not to be measured by any ordinary electrical apparatus, nor is it easy to experiment upon the velocity of a wave which travels (as does light) with a velocity of 186,000 miles in a second.

Direct experimental evidence was first obtained eight years ago by Professor Hertz, in the following way:

Two conductors were placed very near each other and connected, one to each electrode of an induction coil, so that when the coil was in operation sparks should pass from one conductor to the other. Under these circumstances the electricity does not simply jump across the gap and come to rest, but vibrates back and forth in a series of sparks which follow each other at a rate depending upon the shape and size of the conductors used. For those first employed by Hertz, they succeed each other at the rate of 100,000,000 per second. Of course there are not 100,000,000 sparks—perhaps half a dozen, but these follow each other at this rate. On holding near these sparking conductors a ring or rectangle of wire in which was a break at one point, sparks were seen at this break whenever they occurred between the conductors, showing that the electrical vibration had the same power as an electrical current to induce a current in a neighboring wire. Having calculated the number of vibrations per second in these wires, the next question was whether the induction traveled as a wave, or whether the current was produced by the electrical vibration acting directly and instantly upon the wire.

A large sheet of zinc was hung upon the further wall of the room to reflect the wave of induction, if it were a wave, and as a result it was found that at regular distances from the sparking conductors the induced spark in the wire could not be obtained, while at intermediate points it was intensified, just as when waves upon the surface of water are reflected back there are certain points where the surface is at rest, while between these points the water rises and falls in a wave more vigorous than before.

Hertz thus found evidence of the existence of a wave of induction, and succeeded in measuring its length, and from the wave length and the number of vibrations per second he calculated its velocity. This velocity proved to be, as nearly as his experiments would show, equal to the velocity of light.

To further study the similarity between this electrical wave and light, Hertz made two large parabolic mirrors of sheet zinc. In the focus of one of these he placed the two conductors which were in connection with the induction coil; in the focus of the other he placed two similar conductors, between which a spark would jump when they passed between the first pair.

The mirrors were placed facing each other and acted perfectly as reflectors, concentrating the wave and causing a vigorous sparking in the second pair of conductors. Metallic screens placed between the mirrors showed that the wave traveled in a straight line. By a large prism of pitch the wave was bent out of its course as a beam of light is refracted.

So complete was the similarity of the electrical wave to that of light, that not a doubt remains in the mind of any physicist as to the identity, or at least the close connection, of the two.

The extreme interest and importance of these experiments led the writer of this article to desire a picture of the lecture room in the technical college at Carlsruhe, Germany, where the experiments were carried on. Through the great courtesy and kindness of Dr. Lehmann, successor to Professor Hertz in this institution, such a picture has been obtained, and a copy forms the frontispiece of this magazine. The room has been restored, as far as possible, to its condition at the time of the experiments, and such of Professor Hertz's apparatus as still remains intact is shown in the cut. The large reflectors are shown in position, with the prism of pitch placed between them, to determine its refractive power. The circles and rectangles of wire, reflecting sheets of metal, a large wooden frame on which are strung wires for experimenting on the "polarization" of the wave, are all shown. The man who is represented holding this large frame in his hand is Mr. Amann, who assisted Professor Hertz in carrying out his measurements. The picture also shows the stoves and iron columns at the sides of the room, which Professor Hertz afterward believed had introduced certain errors into some of the measurements.

New Metals for Coins.

Advices from Washington, D. C., state that experiments with pure nickel and aluminum, as substitutes for the present nickel pieces and one and two-cent bronze pieces, will be made at the mints by order of Director Preston during September or October. A resolution was passed by the House of Representatives authorizing such experiments. There is some doubt whether the actual adoption of a new metal for the minor coins will be recommended at an early date by the treasury officials, even if the experiments prove successful. The objection to a change in any form of coins or notes is the disposition of the public to refuse the old forms and insist upon having the new. This would drive into the mints for recoinage $14,000,000 in nickel pieces, which are now in circulation, and $7,500,000 in pennies. The advantage claimed for pure nickel, instead of the alloy now used in five-cent pieces, is its greater hardness, durability and distinctness of impression.—*Scientific American.*

TESLA'S ELECTRICAL OSCILLATORS.

The important researches and experiments which Nikola Tesla has been carrying on for years, and which have created such a widespread interest in the scientific world, have culminated in the production of thoroughly practical and efficient electrical oscillators or transformers for the conversion of ordinary direct or alternating currents into electrical vibrations of any desired frequency. In five patents, granted to him September 22, 1896, he shows typical forms of his apparatus as adapted to any of the usual sources of supply. The remarkably clear and simple description of the features involved makes it perfectly easy for any one to understand the operation of these most valuable appliances.

The numerous uses to which these high-frequency transformers can be put will, we believe, cause their rapid and extensive introduction, and it is difficult to estimate the benefit which will result to science and industry from their applications. For lighting with phosphorescent bulbs or tubes, for the production of Roentgen phenomena, for the manufacture of ozone, argon and such bodies, for electro-therapeutic employment, and many uses for which induction coils are suitable, they afford ideal instruments. New applications will no doubt be found, but it is very probable that their chief employment will be for purposes of lighting by high-frequency currents, in which Tesla is the recognized pioneer.

We quote the exact language of the inventor in describing a few forms of his appliances for high-frequency phenomena:

The object of my present improvements is to provide a simple, compact and effective apparatus for producing these effects, but adapted more particularly for direct application to and use with existing circuits carrying direct currents, such as the ordinary municipal incandescent lighting circuits. The way in which I accomplish this, so as to meet the requirements of practical and economical operation under the conditions present, will be understood from a general description of the apparatus which I have devised. In any given circuit, which for present purposes may be considered as conveying direct currents or those of substantially the character of direct or continuous currents, and which, for general purposes of illustration, may be assumed to be a branch or derived circuit across the mains from any ordinary source, I interpose a device, or devices, in the nature of a choking coil, in order to give to the circuit a high self-induction. I also provide a circuit controller of any proper character that may be operated to make and break said circuit. Around the break, or point of interruption, I place a condenser, or condensers, to store the energy of the discharge current, and in a local circuit, and in series with such condenser, I place the primary of a transformer, the secondary of which then becomes the source of the currents of high frequency. It will be apparent from a consideration of the conditions involved that, were the condenser to be directly charged by the current from the source, and then discharged into the working circuit, a very large capacity would ordinarily be required, but by the above arrangement the current of high electro-motive force, which is induced at each break of the main circuit, furnishes the proper current for charging the condenser, which may, therefore, be small and inexpensive. Moreover, it will be observed that, since the self-induction of the circuit through which the condenser discharges, as well as the capacity of the condenser itself, may be given practically any desired value, the frequency of the discharge current may be adjusted at will.

Fig. 1 is a diagrammatic illustration of the apparatus, and Fig. 2 a modification of the same.

Referring to Fig. 1, A designates any source of direct current. In any branch of the circuit from said source, such, for example, as would be formed by the conductors A″ A″ from the mains A′ and the conductors K K, are placed self-induction or choking coils B B and a circuit controller C. This latter may be an ordinary metallic disk or cylinder with teeth or separated segments D D, E E, of which one or more pairs, as E E, diametrically opposite, are integral or in electrical contact with the body of the cylinder, so that when the controller is in the position in which the two brushes F F bear upon two of said segments E E, the circuit through the choking coils B will be closed. The segments D D are insulated, and while shown in the drawings as of substantially the same length of arc as the segments E E, this latter relation may be varied at will to regulate the periods of charging and discharging.

The controller C is designed to be rotated by any proper device, such, for example, as an electro-magnetic motor, as shown in Fig. 2, receiving current either from the main source or elsewhere. Around the controller C, or, in general, in parallel therewith, is a condenser H, and in series with the latter the primary K of a transformer, the secondary L of which constitutes the source of the currents of high frequency which may be applied to many useful purposes, as for electric illumination, the operation of Crookes tubes, or the production of high vacua.

L′ indicates the circuit from the secondary, which may be regarded as the working circuit.

A more convenient and simplified arrangement of the apparatus is shown in Fig. 2. In this case the small motor G, which drives the controller, has its field coils in derivation to the main circuit, and the controller C and condenser H are in parallel in the field circuit between the two coils. In such case the field coils M take the place of the choking coils B. In this arrangement, and, in fact, generally, it is preferable to use two condensers, or a condenser in two parts, and to arrange the primary coil of the transformer between them. The interruptions of the field circuit of the motor should be so rapid as to permit only a partial demagnetization of the cores. These latter, however, should in this specific arrangement be laminated.

In a modified arrangement the coils operating the interrupter are placed in series with a coil of large self-induction, or the latter is dispensed with by giving to the coils a suitable self-induction. Quoting the inventor, "this apparatus may be constructed and combined in very compact form and small compass. Its operation involves but a small expenditure of energy, while it requires practically no care or attention for the continued

production of ozone in unlimited amount."

Dwelling specifically upon the conversion of alternating or undulating currents, Mr. Tesla says:

When the potential of the source periodically rises and falls, whether with reversals or not is immaterial, it is essential to economical operation that the intervals of interruption of the charging current should bear a definite time relation to the period of the current, in order that the effective potential of the impulses charging the condenser may be as high as possible. I therefore provide, in case an alternating or equivalent electro-motive force be employed as the source of supply, a circuit controller which will interrupt the charging circuit at instants predetermined with reference to the variations of potential therein. The most practicable means for accomplishing this, of which I am aware, is to employ a synchronous motor connected with the source of supply and operating a circuit controller which interrupts the charging current at or about the instant of highest potential of each wave, and permits the condenser to discharge the energy stored in it through its appropriate circuit. This apparatus, which may be considered as typical of the means employed for carrying out the invention, I have illustrated in the accompanying drawings.

Referring to Fig. 3, A designates any source of alternating or equivalent current, from which lead off mains A' A'. At any point where it is desired to produce the high-frequency currents, a branch circuit B is taken off from the mains, and, in order to raise the potential of the current, a transformer is employed, represented by the primary C and secondary D. The circuit of the secondary includes the energizing coils of a synchronous motor E and a circuit controller, which, in the present instance, in Fig. 3, is shown as composed of a metal disk F with insulated segments F' in its periphery and fixed to the shaft of the motor. An insulating arm G, stationary with respect to the motor shaft and adjustable with reference to the poles of the fixed magnets, carries two brushes H H, which bear upon the periphery of the disk. With the parts thus arranged, the secondary circuit is completed through the coils of the motor whenever the two brushes rest upon the uninsulated segments of the disk and interrupted through the motor at other times. Such a motor, if properly constructed, in well understood ways, maintains very exact synchronism with the alterations of the source, and the arm G may, therefore, be adjusted to interrupt the current at any determined point in its waves. It will be understood that by the proper relations of insulated and conducting segments and the motor poles, the current may be interrupted twice in each complete wave at or about the points of highest potential. The self-induction of the circuit containing the motor and controller should be high, and the motor itself will usually be constructed in such manner that no other self-induction device will be needed. The energy stored in this circuit is utilized at each break therein to charge a condenser K. With this object the terminals of the condenser are connected to the two brushes H H or to points of the circuit adjacent thereto, so that when the circuit through the motor is interrupted, the terminals of the motor circuit will be connected with the condenser, whereby the latter will receive the high-potential inductive discharge from the motor or secondary circuit.

The condenser discharges into a circuit of low self-induction, one terminal of which is connected directly to a condenser terminal and the other to the brush H opposite to that connected with the other condenser terminal, so that the discharge circuit of the condenser will be completed simultaneously with the motor circuit and interrupted while the motor circuit is broken and the condenser being charged.

The discharge circuit contains a primary M of a few turns, and this induces in a secondary N impulses of high potential, which, by reason of their great frequency, are available for the operation of vacuum tubes P, single terminal lamps R, and other novel and useful purposes.

It is obvious that the supply current need not be alternating, provided it be converted or transformed into

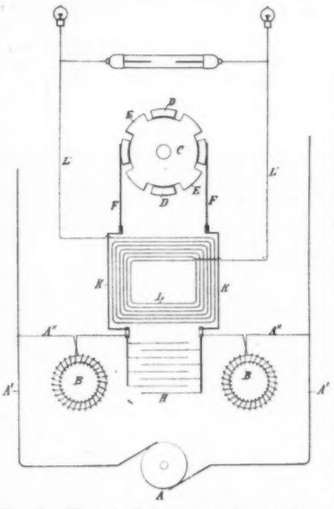


FIG. 1.—TESLA'S ELECTRICAL OSCILLATOR—DIAGRAM ILLUSTRATING CONNECTIONS OF OSCILLATOR AS ADAPTED TO AN ORDINARY MUNICIPAL LIGHTING CIRCUIT.

an alternating current before reaching the controller. For example, the present improvements are applicable to various forms of rotary transformers, as is illustrated in Fig. 4.

E' designates a continuous-current

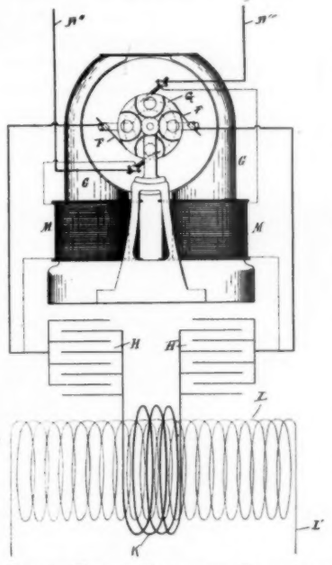


FIG. 2.—TESLA'S ELECTRICAL OSCILLATOR—DRAWING ILLUSTRATING A SIMPLIFIED FORM OF OSCILLATOR AND CONNECTIONS.

With such arrangement it is evident that any two adjacent segments *c c* become the terminals of an alternating current source, so that if two brushes H H be applied to the periphery of the cylinder, they will take off current during such portion of the wave as the width of segment and position of the brushes may determine. By adjusting the position of the brushes relatively to the cylinder, therefore, the alternating current delivered to the segments *c c* may be interrupted at any point in its waves.

While the brushes H H are on the conducting segments, the current which they collect stores energy in a circuit of high self-induction formed by the wires *f f*, self-induction coils S S, the conductors B B, the brushes and commutator. When this circuit is interrupted by the brushes H H passing on to the insulating segments of the controller, the high-potential discharge of this circuit charges the condensers K K, which then discharge through the circuit of low self-induction containing the primary M. The secondary circuit N contains any devices, as P R, for utilizing the current.

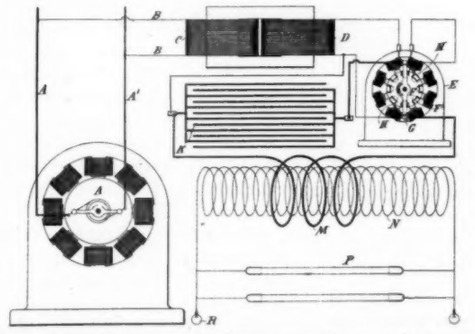


FIG. 3.—TESLA'S ELECTRICAL OSCILLATOR—DIAGRAM ILLUSTRATING APPARATUS AND CONNECTIONS AS ADAPTED TO A MUNICIPAL ALTERNATING CURRENT OF SUPPLY.

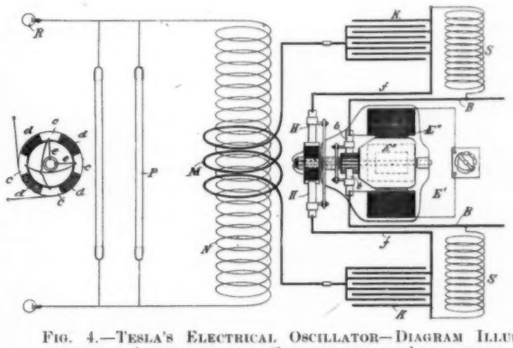


FIG. 4.—TESLA'S ELECTRICAL OSCILLATOR—DIAGRAM ILLUSTRATING APPARATUS AND CONNECTIONS AS ADAPTED TO A FORM OF ROTATING TRANSFORMER OPERATED FROM A MUNICIPAL LIGHTING CIRCUIT.

motor, here represented as having four field poles wound with coils E' in shunt to the armature. The line wires B B connect with the brushes *b b* bearing on the usual commutator.

On an extension of the motor shaft is a circuit controller composed of a cylinder, the surface of which is divided into four conducting segments *c* and four insulating segments *d*, the former being diametrically connected in pairs, as shown in detail in Fig. 4.

Through the shaft run two insulated conductors *e e* from any two commutator segments 90 degrees apart, and these connect with the two pairs of segments *c*, respectively.

In other arrangements, circuit controllers of special construction are shown mounted on the shaft of a generator, and a transformer is employed in connection to raise the tension of the supply current.

In regard to the regulation of his system Tesla says:

It is well known that every electric circuit, provided its ohmic resistance does not exceed certain definite limits, has a period of vibration of its own analogous to the period of vibration of a weighted spring. In order to alternately charge a given circuit of this character by periodic impulses impressed upon it and to discharge it most effectively, the frequency of the impressed impulses should bear a definite relation to the frequency of vibration possessed by the circuit itself. Moreover, for like reasons the period or vibration of the discharge circuit should bear a similar relation to the impressed impulses or the period of the charging circuit. When the conditions are such that the general law of harmonic vibrations is followed, the circuits are said to be in resonance or in electro-magnetic synchronism, and this condition I have found in my system to be highly advantageous. Hence in practice I adjust the electrical constants of the circuits so that in normal operation this condition of resonance is approximately attained. To accomplish this, the number of impulses of current directed into the charging circuit per unit time is made equal to the period of the charging circuit itself, or, generally, to a harmonic thereof, and the same relations are maintained between the charging and discharge circuit. Any departure from this condition will result in a decreased output, and this fact I take advantage of in regulating such output by varying the frequencies of the impulses or vibrations in the several circuits.

Inasmuch as the period of any given circuit depends upon the relations of its resistance, self-induction, and capacity, a variation of any one or more of these may result in a variation in its period. There are, therefore, various ways in which the frequencies of vibration of the several circuits in the system referred to may be varied, but the most practicable and efficient ways of accomplishing the desired result are the following: (*a*) Varying the rate of the impressed impulses of current, or those which are directed from the source of supply into the charging circuit, as by varying the speed of the commutator or other circuit controller; (*b*) varying the self-induction of the charging circuit; (*c*) varying the self-induction or capacity of the discharge circuit.

To regulate the output of a single circuit which has no vibration of its own by merely varying its period would evidently require, for any extended range of regulation, a very wide range of variation of period; but in the system described, a very wide range of regulation of the output may be obtained by a very slight change of the frequency of one of the circuits when the above mentioned rules are observed.

TELEPHONE NEWS AND COMMENT.

The Colorado Telephone Company has put in a $10,000 exchange at Cripple Creek.

The Keystone Telegraph and Telephone Company has been granted a franchise at Pottstown, Pa.

Northfield, Mass., has a telephone exchange, with Landlord F. E. Stimpson as president. The service is good.

An effort is being made to tax tel phone, telegraph, electric light and railway poles $1 per annum in Norristown, Pa.

An ordinance granting a franchise to the Western Telephone Construction Company has passed the Cortland, N. Y., council.

The Providence Telephone Company is adopting the graduated toll and rental system, similar to New York city. It will be a success.

The Bell opposition is asking for a telephone franchise at Auburn, N. Y. Tracy C. Becker and Oliver Watson, of Buffalo, are the gentlemen interested.

The new Home Telephone Company, of Baltimore, Md., is now operating 100 telephones and expects to connect up 400 more during the next 60 days.

The two telephone exchanges in Florence, Tenn., are managed by ladies. Mrs. M. D. Irvine is manager of the Southern Bell, and Mrs. J. W. Walker is manager of the Citizens.

The Erie Telegraph and Telephone Company made a net gain of 331 subscribers in August, making a net gain for the eight months of this year of 1,823. Total subscribers September 1, 20,414.

The American Telephone and Telegraph Company (long-distance) is arranging to extend its lines through St. Paul to Duluth, Minn. It now reaches Madison. Mr. C. D. M. Cole is in Duluth representing the American Telephone and Telegraph Company.

There are said to be 2,675 shares of the American Bell stock standing in the name of J. P. Morgan & Company. W. H. Forbes and W. Murray Crane are the only larger individual stockholders, owning about 3,200 shares each.

The Hudson River Telephone Company has strung two additional wires from Albany to Schenectady, and four to Troy, necessitated by the demands of increasing business. A lot of other lines have also been recently extended.

The Gilliland Telephone Company, of Niles, Mich., in conjunction with the telephone system of South Bend, Ind., will construct a line between the two cities, and another will be built from Benton Harbor to Niles and Dowagiac, and possibly Kalamazoo.

An attempt is being made to organize a new telephone company in Kansas City, Mo., with a capital of $300,000, and A. J. Snider and J. S. Welsh, president and vice-president, respectively. The company is to be known as the Standard Telephone Company.

The Central Union Telephone Company is introducing the party-line system in Ohio with success. Four or five subscribers on a line reduces the cost and satisfies the small user, where the improved instrument, which can not be interrupted while in use, has been installed.

A franchise was granted the Western Telephone Construction Company by the trustees of Corning, N. Y., last week, to put in a telephone system and operate it, providing it is commenced on or before May 1, 1897, and is completed and in working order September 1, 1897.

The following cities in Iowa now have home telephone companies: Oskaloosa, Creston, Grinnell, Waterloo, Cedar Falls, Manchester, Marshalltown, Boone, Sioux City and many smaller towns. Fort Dodge, Clinton and other places are now organizing local companies.

The Harrison Telephone Company, of Topeka, Kas., has been sold by the sheriff. The venture is said to have cost $45,000, and brought at the sale $8,000, bid by E. A. Rosier, who held a judgment of $11,000. The local Bell company now owns the plant and will close it up October 1.

The directors of the American Bell Telephone Company declared the regular quarterly dividend of three per cent on Wednesday last. This makes 10½ per cent declared so far this year—three regular quarterly dividends of three per cent and one of one and one-half per cent extra, declared in June, payable July 15.

Mr. Charles E. Fink, president of the Southern States Telephone Company, and Mr. J. A. Helvin, superintendent of the company, are arranging to put their service in operation in Portsmouth, Va. The work of stringing wires and laying cables will, these gentlemen say, begin next week. The company starts off with about 100 subscribers in Portsmouth.

The Valley Mutual Telephone Company, which will operate in the three cities, Bay City, West Bay City and Saginaw, Mich., is to begin the work of construction. Messrs. F. S. Dewey and F. D. Crissman, of Alpena, are interested in the company. The preliminary work of securing the franchises, contracts and selling of stock has been going on all Summer, which work is now about completed.

Who Can Tell All About Chestnut Trees and Poles?

To the Editor of Electrical Review:

I am anxious to be enlightened on a matter that has been very perplexing to me and, I believe, many others, and would thank you for any light you or any of your readers can give.

What is the difference between "red" chestnut and "white" chestnut? I have consulted many old "linemen" and "woodsmen," and they all seem to differ in opinion. Some claim that there are two distinct varieties of chestnut—"red" and "white"—but I fail to see any difference in the leaf, shape of the tree or the nuts they bear. Some claim that the "red" chestnut grows on the hills, or high ground, and the "white" grows in the hollows, or moist places. I have heard old woodchoppers say they always find "red" chestnut growing on the east side of a mountain, or hill, where it gets more sun and develops more rapidly, hence the large rings and coarse grain; and that the "white" chestnut is found on the shady side and develops more slowly, and the grain finer and the rings smaller. Many linemen claim that *all* second growth, or sprouts growing out of the old stump, are "white," and that "red" chestnut is the old tree that bears the nuts; but this theory was all exploded to my satisfaction last October when going through the mountains near Blue Ridge Summit, Pennsylvania, with an old, experienced "lineman" selecting a lot of poles. We saw the axeman cut from the same stump two red chestnut trees and one fine white chestnut, all about the same size and having the same general appearance outside. The axeman said he had worked in timber all his life and he had never learned any way of distinguishing a white from a red chestnut before felling the tree or cutting into it. The lineman with me said he always contended that the red chestnut was diseased, and this particular case goes far toward proving his theory correct.

I would like to hear from any one interested in the business, and most of all I would like to know of some way to tell a "red" chestnut without cutting into it. The matter is important, inasmuch as most telephone and telegraph companies reject "red" chestnut, because it does not last more than a few years; and if a man is obliged to cut a tree down to find out what it is, it looks like a waste of timber, and makes the white poles the more expensive.

I would like also to know whether or not a pole that is very large at the butt and small at the top is considered a healthy growth.

W. J. C. Jacobs,
Manager Chambersburg, Pa., Telephone Exchange.
September 23.

Who Makes a Successful Rock Drill?

To the Editor of Electrical Review:

Will you kindly advise me if there is a successful electric rock drill upon the market, and if so, by whom it is manufactured?

L. A. Smith.
New York, Sept. 23.

THE GOOD FORTUNE OF MR. R. T. McDONALD.

A REMARKABLY RICH OIL WELL DISCOVERED IN INDIANA, NEAR INDIANAPOLIS. WHICH IS HIS PROPERTY.

Mr. R. T. McDonald, the well known president of the Fort Wayne Electric Corporation, Fort Wayne, Ind., is the owner of an oil well recently discovered, that is roughly estimated to have an output of from 150 to 250 barrels per day. The oil was discovered while prospecting for gas for the Bellevue Land Improvement Company, a suburban property about six miles from Indianapolis. Some 3,000 acres have been leased for the purpose of prospecting for gas, and the discovery of oil was a complete surprise to every one. The oil burst forth from a well that had been sunk for gas while no one was near, and spurted over 150 feet high, and flooded the adjacant country for quite a distance, and startled everybody in the neighborhood. A number of empty barrels were hastily secured and some 25 or 30 filled, and after considerable delay the well was corked up to remain until Mr. McDonald, who is almost the sole owner of the property, returns. He is expected this week.

There is great excitement around Indianapolis over this discovery, and a great deal of prospecting is being done. Mr. McDonald's people are sinking additional wells, and it is understood that he has already refused an offer of $100,000 for the property. His large circle of friends in the electrical field will congratulate him over this lucky find.

The Fort Wayne Electric Corporation, of which he is the head, is also doing a very large business, the August business, notwithstanding the depressed times, being quite extensive and profitable.

American Institute of Electrical Engineers.

The first meeting of the season of the American Institute of Electrical Engineers was held at 12 West Thirty-first street, New York, September 23. President Louis Duncan delivered his inaugural address, the subject chosen being the "Present Status of the Transmission and Distribution of Electrical Energy." It will be published later.

Messrs. Steinmetz, Wolcott, Lamb, Ries, and others took part in the discussion.

At the meeting of the executive committee in the afternoon, the following associate members were elected: Henry Morton Brinckerhoff, Chicago, Ill.; Harold Gregory Meadows, Buffalo, N. Y.; F. J. Newbury, Trenton, N. J.; Julio Pinkas, Sucre, Bolivia; Chas. W. Richards, Boston, Mass.; Chas. G. White, Lake Linden, Mich.

The electric road project at Westfield, N. Y., has come to a standstill on account of uncertainty surrounding the outcome of the political campaign. The projectors do not wish to go ahead until it is known whether the country is going on a gold or silver basis. When that point is settled they will know what to do and will go ahead.

ELECTRIC RAILWAY NEWS.

The Evanston, Ill., Electric Railway Company has filed a big mortgage in the recorder's office. The amount is $1,000,000, and the mortgage is to the Royal Trust Company.

From Prospect street, Cambridge, Mass., to the power house in East Cambridge, the West End Street Railway is putting in return underground wires. This is to prevent electrolysis.

The Lynn, Mass., railway consolidation deal, which would result, if carried out, in an extensive development of electric transportation on the north shore, is said to be in the minds of interested capitalists.

The Board of Trustees of Tarrytown, N. Y., have deferred the application of the White Plains & Elmsford Electric Railway Company for a franchise. The trustees are not satisfied with the proposed route.

The Warren, Mass., Brookfield & Spencer Street Railroad petitioned the State Railroad Commissioners for permission to issue $100,000 of bonds. The road was built at an expense of $250,900, and $150,000 capital stock was paid in.

It is reported by parties connected with the People's Cable Railway, of St. Louis, Mo., that within a very short time the motive power will be changed to compressed air. The franchise, recently granted, permits the company to adopt electricity or compressed air for a new motive power.

The work of equipping the North Woburn Street Railway, of Woburn, Mass., for operation by electricity is nearly completed. A new engine and generator have been acquired by the Woburn Electric Light Company to furnish power. An electric railway from North Woburn to Wilmington is being discussed.

The new Milwaukee, Racine & Kenosha Electric road, now being built between Racine and Milwaukee, Wis., will have the finest bed of any electric road in the country. One of the officials of the new road said that every bit of track would be rock ballasted, making it as good a roadbed as many steam railroads have to-day.

Utica, N. Y., Belt Line Street Railway Company's gross earnings, April 1 to June 30, 1896, $43,101; ditto, 1895, $41,514; increase, $1.597. Net earnings, $17,214; ditto, 1895, $17,799; decrease, $585. From January 1 to June 30, 1896: Gross earnings, $81,751; ditto, 1895, $75,127; increase, $6,624. Net earnings, $30,998; ditto, 1895, $29,957; increase, $1,041.

The franchise granted to construct and operate an electric line between West Bay City, Mich., and Saginaw, to be known as the Rapid Transit Railway, is null and void, the projectors having failed to file the necessary bond of $5,000. F. M. Atterholdt, president of the corporation, will petition the council to grant a new franchise to be taken up next Spring.

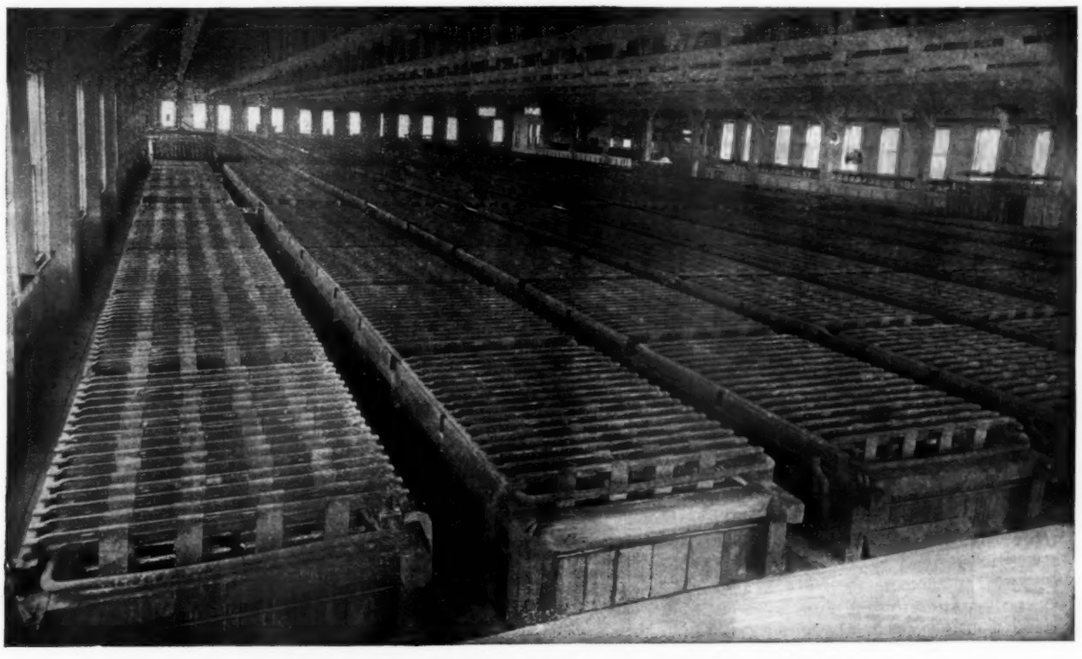
The substantial growth of the Nassau Electric Railroad Company's business, of Brooklyn, N. Y., within a few months has necessitated important changes in general offices, car houses and repair shops, which are now being made. Fine new headquarters have been fitted up in Twenty-third street. The car houses of the old Atlantic avenue line have been extended, and a new repair shop is being built.

The hearing before the State Railroad Commission upon the application of the Third Avenue Railroad Company, of New York city, for permission to change the motive power from cable to electricity on the extension of its Kingsbridge line, has been concluded. The application was opposed by ex-Lieutenant Governor Sheehan, while Edward Lauterbach, of the company, argued in favor of it. The commission took all the papers of the opposing counsel and stated that a decision would be rendered at as early a date as possible.

The total length of all the street railway and traction lines—city, suburban and interurban—in the United States is 15,956 miles, against 13,176 in 1895. These roads own 28,154 passenger cars, 20,777 motor cars, 206 dummies and 28,621 horses. Since 1891 the number of horses has declined 162,000, or 80 per cent. The capitalization of 15,425 miles of these street railroads is $828,547,285 in stock and $525,949,928 in bonds, an average per mile of $53,7.3 of stock and $34,000 of bonds, equal in the aggregate to $87,809 of stock and bonds, as against $60,188 per mile for steam railroads.

The Anaconda Copper Mine.

The copper refinery of the famous Anaconda mine was built under the direction of Mr. Herman Thotehrn, an experienced French engineer and metallurgist. Through the courtesy of our esteemed contemporary, *The Engineering and Mining Journal*, we are privileged to present a view of the refinery, with description. The tanks are built on the self-insulating plan, the air having access to all parts. A wooden framework in the shape of a regular girder is covered on the inside with common planks, and is cut up into compartments by partitions of the same material, 10 of which form a row. Each row of 10 tanks is set on its own foundation, entirely separated from the others and from the working floor. A large air space is between each compartment forming a tank between the working floor and the rows, and all parts of the tanks, at the side as well as below, are of easy access for the air and for the men. Each joint in the woodwork, from top of the tanks to the bottom of the foundation, is insulated by soaking with insulating material before being put together. The inside of the tanks is lined with lead, and proper protection is provided to preserve it against waste from the copper plates (anodes). On the sides of the tanks the conductors are placed for the electric current, serving at the same time as a support for the electrodes. The bars are of solid copper and are bent in the middle, each reaching over two tanks, being positive on one and negative on the other tank. By means of this bend in the bars all screw connections are avoided between the tanks, leaving only the connections between the different rows to be fixed in the usual way. This effects an important saving of labor and power, as it is very difficult to maintain good joints for so heavy a current in an atmosphere charged with acid, steam or moisture. To support the electrodes, flat iron bars are laid across the tanks, resting on the conductors. Copper hooks sustain the plates in the liquid and are hooked on these bars. Ten tanks built together make a row; ten rows make a set of 100 tanks, and two sets make a system of 200. Each system fills a hall, and each hall is provided with a complete outfit of machinery, tools and appliances, making it entirely independent of the other halls; in fact, forming a complete plant by itself. As the composition of the crude copper changes in regard to its impurities, and as the electrolyte has to be modified according to the amount of such impurities, it is absolutely necessary to be able to separate each system from the others. There are six systems of like capacity of 200 tanks, each being able to turn out about 35 tons of electrolytic copper per 24 hours as a maximum. All the tanks of each system are connected in series for the passage of the electric current produced by one generator. Each row of 10 tanks has its individual supply tank for the circulation of the liquid. The circulation is established by having the rows built on an inclined plane. The liquid runs by gravity from one tank to the next until it reaches the last one, from which it falls to the collector. The collector conveys the liquid to the acid pumps, working by air pressure, which deliver it anew to the distributor, and from there to the small supply tanks, to begin the same course over again.



VIEW OF THE ELECTROLYTIC REFINERY OF THE ANACONDA COPPER MINE.

The crude material upon which the refinery works is blister copper, containing 98 per cent copper on the average, and the balance in arsenic, antimony, iron, lead, tellurium, selenium, besides about 110 ounces of silver and one-third ounce of gold to the ton.

The Anaconda Copper Mining Company's refinery has been running in full since January 1 of this year, and is turning out between 100 and 120 tons of copper daily, according to the output of the mines. The balance of the company's product, from 80 to 100 tons, is refined in Baltimore. The total daily production of the Anaconda company is about 200 tons of copper. The refinery is built in such a way that in case of an emergency it can easily handle the total product of 200 tons daily with the use of additional dynamos only.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, SEPT. 30, 1896.

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The following despatch to Boston from New York may be classed under the heading, "important if true," and yet we should not be surprised to see just such a combination and electrical deal consummated within the next two years: "There is evidence that negotiations are going on which may result in the formation of a third company to control ultimately both Manhattan and Metropolitan, both systems to be equipped with electricity and operated from central stations. The economy, it is said, will amount to double the present net earnings of both systems at least."

There are a number of learned essays on telephoning across the ocean appearing in our lay exchanges, since the announcement that a Russian inventor had discovered a telephone adapted for that purpose. There is nothing to prevent talking across the ocean, except the cost of the cable that would be required. At present that is prohibitory.

The following from the Philadelphia *Ledger* is a deserved tribute to a modest, earnest toiler in the field of telegraphy:

By awarding one of its important prizes to Patrick B. Delany for his system of high-speed telegraphy, the Franklin Institute has given that invention an indorsement that carries confidence with it, for the institute is composed of men of high attainments and scrupulous integrity. It does not bestow its favors lightly, and before awarding such a prize as the Elliot Cresson Gold Medal, these scientific experts must be satisfied that the invention is practical and useful. It follows, then, that in the judgment of men who ought to know, Mr. Delany has given to the world a method by which from 1,000 to 2,000 words a minute may be telegraphed. Should the government adopt it, the question of postal telegraphy would be greatly simplified, if not solved. If, on the other hand, one or all of the great telegraph companies should adopt it and begin transmitting correspondence at a cost low enough to induce the people to use this method largely, the effect on the postal service would be very serious, as it would cut down the only profitable branch of the service—the letter mail.

TESLA'S ELECTRICAL OSCILLATORS.

Those who have followed the development of electrical industry in recent years, and more particularly the application of alternating currents for industrial purposes, will be able to justly appreciate the great services which Mr. Nikola Tesla has rendered to the world in this field of endeavor by his discovery of the rotating magnetic field, recorded in this journal early in 1888. They will remember that a few years after this publication, Tesla startled the scientific world through his brilliant lectures here and abroad, in which he disclosed entirely novel phenomena, produced by high-frequency currents. In these lectures he showed for the first time the possibility of lighting by means of phosphorescent bulbs and tubes. The currents he obtained either by specially constructed machines or by means of a new form of induction coil, now commonly known as the Tesla coil, or transformer.

Since his original announcement in this later field, Tesla has incessantly labored to simplify and improve his methods and apparatus, and as an evidence of his progress we only need recall to our readers his valuable contributions to the Roentgen phenomena, which he was able to so exhaustively investigate by the help of his perfected coils, or "oscillators." We also recorded, a few months ago, the remarkable results he obtained in the production of light of high candle-power by vacuum tubes.

Mr. Tesla now comes forward with perfected and extremely simple transformers, or oscillators, adapted to every-day use with ordinary sources of current supply. We believe that the importance of the advent of these new implements for the development of science and industry can not be overestimated. That high-frequency currents are destined to play an important part in the practical applications of electricity there can be no doubt, and with the introduction of efficient high-frequency transformers adapted to ordinary circuits their numerous uses are sure to come at once. The old and familiar form of induction coil, with its multitude of uses, can not possibly survive when a new inductive apparatus is at hand fully as simple, but far more economical, and requiring only a minute fraction of the wire needed in the old form.

Tesla has been working arduously for a number of years to bring about these results, as evidenced by the publication of his always original researches, and it is most unfortunate that his progress was delayed by the destruction of his laboratory a year and a half ago.

We heartily congratulate him on his practical success, as placed on record in the patents granted to him last week, on which we dwell on another page in this issue.

OBITUARY.

Mr. David C. Sprague, father of Lieut. Frank J. Sprague, the well known electrical engineer and inventor, was killed by a fast train in Rahway, N. J., on September 24. He attempted to cross the track, evidently not hearing the approaching train, and was struck and killed. Mr. Sprague was about 63 years of age, and at the time of his death was manager of the Eustis Manufacturing Company at Rahway. At one time he represented the Sprague Electric Railway and Motor Company in Buenos Ayres. It is a singular coincidence that a brother of Mr. D. C. Sprague was killed by a train several years ago.

Paper telegraph poles are the latest development of the art of making paper useful. These poles are made of paper pulp, in which borax, tallow, etc., are mixed in small quantities. The paper poles are said to be lighter and stronger than those of wood, and to be unaffected by sun, rain, dampness, or any of the other causes which shorten the life of a wooden pole.

THE FINANCIAL SIDE.

The stock market had a sharp recovery this week, and towards the close it began to look as if a movement in discount of McKinley's election was under way. In almost every business quarter encouraging reports were received and evidences of returning confidences were met on every side. The continued heavy import of gold, part of which is finding its way into the government's reserve, is regarded as of first importance in bringing about this change in affairs.

The banks departed from their ironclad rule, adopted three weeks ago, by lending rather freely on first-class paper at slightly reduced rates. This, however, was one of the effects of the cause noted preceding. Mechanical market reactions should not be surprising next week, although close students of the situation claim that a still higher and permanent level of values will be reached at least before the first week in October.

There was very little of interest in the electrical-financial world beyond the declaration of the usual quarterly dividends.

Edison Electric Illuminating of New York declared 1½ per cent, payable November 2 to stock of record October 15. American Bell Telephone, 3 per cent, payable October 15 to stock of record October 1. Postal Telegraph, 1 per cent, payable October 15 to stock of record October 5. Central & South American Telegraph, 1¾ per cent, payable October 6 to stock of record October 1. Mexican Telegraph, 2½ per cent, payable October 14 to stock of record October 8.

The improvement in quotations in the electrical stocks was natural in view of the general market improvement. Western Union and General Electric each gained about 2 per cent, touching 83⅞ and 29¼, respectively, and closing near top figures. Edison Electric Illuminating sold early in the week at 92¼ and later at 93¼. The Edison Illuminating Company of Brooklyn sold at 96. American Telegraph and Cable jumped from 82⅞ to 90, on very limited transactions.

In Boston, Bell Telephone lost 1, selling at 205. Erie Telephone was steady at 86½, and New England Telephone at 90. General Electric preferred gained 1 point to 65. Westinghouse common was 24 @ 26, and the preferred, 50½ @ 51. In Philadelphia, Storage Battery stocks were very quiet and firm. The common advanced 1¾ to 28¾, and the preferred 1½ to 30. Pennsylvania Heat, Light and Power was practically unchanged, closing at 13½. BAIN.

New York, September 26.

No Faith in Fenders.

[*From Inventive Age.*]

The ELECTRICAL REVIEW feels that something is wrong—has heard of no new inventions in the street-car fender line for three weeks. It would have been fully as well for the public if four-fifths of those invented already had never been heard of.

PERSONAL.

Mr. George H. Guy, secretary of the New York Electrical Society, is spending a few weeks in London.

Mr. John E. Hudson, of Boston, president of the American Bell Telephone Company, returned home from a European vacation last week.

Mr. John I. Sabin, of San Francisco, the well known telephone magnate, arrived in New York city last week, on his return from a vacation, spent in Europe.

Mr. H. L. Lufkin, of the Crocker-Wheeler Electric Company, has returned to New York city after a six weeks' absence, spent among the free silverites of Montana.

Mr. Max Osterberg, E. E., A. M., has established himself as a consulting engineer and electrical expert at 27 Thames street, New York city. He will make a specialty of gas engine installations in connection with storage batteries.

Mr. T. F. Grover, superintendent of the Milwaukee & Wauwatosa Electric Company, has been appointed general manager of the Fond du Lac, Wis., Electric Light and Power Company, and will assume his new duties on October 1.

Mr. Herman Thotehrn, of Paris, an eminent mining engineer and metallurgist, is visiting in New York city, and is making his headquarters at 17 West 32d street. He is looking after the development of some large mining interests.

Straightening a Chimney.

The straightening of a chimney stack at a brick and tile works located at Earnest, Pa., was recently accomplished in a novel manner. The stack is 122 feet high, 11 feet square at the base, tapering somewhat at the top, and weighs 400 tons. The walls are 36 inches thick. The top was found to be leaning 45 inches from the vertical line. To right the chimney, 10½ inches of brickwork was removed from the foundations on three sides. As the bricks were removed, square blocks of wood were inserted, one after another, until three sides of the structure rested on the block. Between the blocks substantial brick piers six inches high were built, leaving a space four and one-half inches between the top of the piers and the bottom of the undermined brickwork. The blocks were then set on fire and kept burning evenly. If one burned faster than the others, the fire on that particular block was checked, so that all were made to burn uniformly, and as the blocks were reduced to ashes, the stack slowly righted. As the top gradually swung back through the 45-inch arc, small fissures appeared near the base. In every groove a steel wedge was driven to maintain the weight of the walls. The entire work consumed one day, and the reduction of the wooden blocks to ashes required one hour.

The Clarksville, Tenn., Electric Light Company has assigned. Liabilities less than $100,000.

GAS VERSUS ELECTRICITY DIRECT FROM COAL.

BY D. M. DUNNING IN THE "ENGINEERING MAGAZINE."

For a number of years we have heard of the great things that were to happen when science achieved the production of "electricity direct from coal"; yet it does not seem to have occurred to many that ordinary illuminating gas is, and always has been, produced "direct from coal." The purpose of this paper will be to show, in a practical way, that, with the modern gas works, handled in an up-to-date manner, an efficiency can be attained which is about all that could be produced, even should science succeed in the production of "electricity direct from coal." In doing this it will be desirable first to briefly describe the modern gas works and some of the essential advantages to be derived from it, in comparison with the works in use until the past few years.

The day has certainly gone by when the gas manager can sit quietly around and allow his works and business to run him. He must now reverse things—run the works and push the business; and so thoroughly has this become recognized that the industry, where properly managed, has already become one of the most prosperous in the land. It has held its own through the shrinkage of values and financial reverses of the past few years better than almost any other, and, where it has kept clear from electrical entanglements, has paid its dividends with surprising regularity.

In the way of the utilization of residuals, and illumination through incandescent lamps, it has, through the aid of science, made most rapid advances, and still presents, in these and other lines, the broadest fields for scientific research and investigation. At various times it has, in the minds of many, been threatened with serious, if not fatal, competition from electricity; yet the gas industry is probably to-day in a healthier and more prosperous condition than it would have been if electricity had never been a competitor, because the electric light has created a demand for more light and a stronger light, which, together with its competition, has stimulated the gas industry to improvement and to advance and extend its business; and on these lines, and with the aid of lower prices, the future manager seems to have an almost unlimited field.

In the evolution of the modern gas works one of the first and most important steps was the construction of the "regenerative furnace." Only a few years ago, with the old-style furnace then in use, it was the common thing to consume fully one-half the coke produced in the furnace itself; and, with no special effort made to find a market for the other half, it often became a cumbrous thing about the works, and was disposed of in liberal measure and at nominal prices, which practically destroyed its market value. We now have in common use the "regenerative furnace," which, with its essential features of primary and secondary combustion, is a remarkably economical generator of heat. By secondary combustion I mean the combustion of the unconsumed products of the first combustion, which is brought about by a secondary supply of air at a point just above the furnace proper. In this manner, together with an ingenious arrangement of flues for heating the air supply with the otherwise waste heat of the furnace, the efficiency of the furnace has become fully doubled, so that we are now able to carbonize our coal with about one-fourth of the coke produced. Another important advantage of the modern furnace is the transfer of the coke without quenching, whereas, with the old furnace, it was necessary to quench the coke, and then fire it up again. This furnace also affords a very marked saving in depreciation and labor, especially if run with moderate heat, as it should be; and the large amount of coke saved, if properly stored and marketed among people educated to its use, becomes a very important by-product, and, in such works as are in proximity to the bituminous coal fields, nearly, if not entirely, liquidates the coal bill.

And, with the great saving in this by-product, there has been achieved a still greater in the two other by-products—namely, tar and ammonia. Within the memory of the writer, coal-tar was a serious annoyance to the gas manager, because it had to be disposed of in some way other than as ordinary sewage; and it was not an uncommon occurrence to be obliged to haul the major portion of it out into the country and there burn it, hoping to sell the remainder for local use for enough to defray such expense. To-day it can probably be safely said that in no branch of chemistry has science delved so deeply as in that which deals with the black and sticky mass of coal-tar, and certainly from none has it produced more brilliant results, the productions being already numbered among the thousands, comprising nearly all of our most beautiful colors, such as the aniline series, and the most important of our medical remedies, one of which—phenacetine, of the antifebrin class—has acquired a world-wide reputation; altogether, the list seems as limitless as the starry heavens, and as yet about as unexplored. Saccharin, a thousand times sweeter than sugar, suggests that, if we have sufficient faith, and work, we may yet live on tar. Coal-tar products have acquired so important a place in the arts, sciences and manufactures that this by-product has become a well established article of commerce, and undoubtedly pays, for the average gas works, about 25 per cent of the coal bill.

(*To be continued.*)

It is expected that the Brush factory at Cleveland will be combined with the Lynn, Mass., factory of the General Electric Company at the latter city.

HOW CAN WE PREVENT ACCIDENTS AND INCREASE THE GENERAL EFFICIENCY OF EMPLOYEES?

BY W. W. COLE, ELMIRA, BEFORE THE NEW YORK STREET RAILWAY ASSOCIATION.

There are certain accidents which occur upon the best regulated railroads that can never be averted. They are the results of two agencies: Fate and the fool-killer. And there are others which occur through defective apparatus, poorly conditioned motormen or gross carelessness of employés. One of the first and most important requisites to improving the efficiency of the road and preventing accidents is the selection of employés, and to this end the application blank is an important factor; and such questions should be asked as to generally outline a man's past.

The question, do you own real estate or personal property, is important, as a man who has accumulated property while working for small pay, must necessarily be economical and appreciate laws governing the protection of property, and is apt to have care for the property of others.

To what extent are you in debt? I think we will all concede that a man who is badly in debt will not only prove a nuisance to a company, but he is apt to take but a short-lived interest in his work, and become careless. Constant requests are made upon a company to compel a man to pay his back bills, and a company loses many friends unless such matters are given attention.

Do you use intoxicants? and have you ever been addicted to the use of intoxicants? These questions need no comment.

What are the highest wages you ever received? Now the best man for a place is the satisfied man, who thinks he is doing well. And a man who has commanded higher wages than you pay is sure to believe sooner or later that you do not appreciate his real value, and he becomes dissatisfied, and will either take more interest in looking for another place, or in airing his trouble before the other men; and he becomes careless in his duties either way.

The other questions are such as will tend to delineate a man's stability and character. I believe that all men should be placed under at least $200 bonds, as it not only has a restraining influence upon the man, but so many business men, in order to get rid of a man with little trouble, will give him a first-class recommendation, but they will hesitate to go upon his bond unless they know something of his ability, reputation and personal habits. When you employ a man under bonds, you have practically got him registered with his friend's approval.

Great care should be taken in the choice of instructors of motormen and conductors, and to the end, it is well to keep a book recording all acts of disobedience or carelessness of each employé, and then select as instructors the men having the best record. It has been my experience that a new man is apt to learn very readily any little tricks of carelessness his instructor may have acquired. After a man has been turned in as competent to run by his instructor, I think he should pass an examination as to his duties, and upon the rules and regulations of his company. I submit examination papers containing such questions as generally apply to the operation of street railroads.

Such an examination is beneficial in several directions, as it makes a man think about his duties, and he will discuss the question with other employés and get their ideas, and the men will generally take more interest in their duties; and it also enables the men to frame readily into words intelligent answers to questions as to their duties and the rules and regulations. It is sometimes very important that a man should be able to make proper answers to such questions. I think all motormen should be furnished with a blank report, to be filled out each evening, or after his run, as to the condition of his car, and report all trouble with brakes or any defects with running gears or apparatus, and place his report on file for the foreman of the shop, who should have an immediate inspection made of the car reported. The report should be O. K'd. by the man making such inspection, and then sent to the master mechanic or superintendent. Where verbal reports are made by motormen, the men in the shop are apt to give them careless attention; and when an accident is the result of defective brakes, or an armature burns out from a broken connection run too long, it is difficult to fix the blame upon the individual, as when the motorman makes a verbal report, no man in the shop can be found who heard it. Or when a car has been reported twice for the same trouble, you have a check upon the man who has made the inspection, and he has been careless or the motorman is a fault-finder; but these are facts for individual inference.

One of the most important preventives of accidents is a through system of shop inspection, and such reports should be made as would show, when a car is in shop, just what repairs were made, and the time and material consumed. If a car is in the shop for brake shoes, and is allowed out of shop, and two hours later is pulled out of service for split trolley wheel, or some loose contact, I should consider that the system of car inspection was faulty, and cars liable to be let out of shop when they were defective, and either the man or the system needed a change.

A system of reports in all departments that will form a connected chain, to check the work of the individual, is of benefit, when such reports are not complicated and are always attended to. I do not claim that such a system will make a good man out of a poor one, as my experience has been that it is much easier, and the result more satisfactory, to discharge a poor man, and get a good one in his place, as the process of educating a careless or incompetent man is too much like the horse that fed on excelsior. When he got so he was used to it and relished it, he died.

Accidents are frequently occurring from loss of power, when it is most needed. No road should, from an economical point of view, try to run too close on a theoretical consumption of power. This is especially so in the case of small roads, operating from 5 to 15 cars, and is of special significance where there are grade crossings; as, in case a trolley flies off, it is apt to be placed in a hurry with the power on, and this means a sudden jerk, especially on a jump-over crossing; and where a road is running close to its full power capacity, and the power goes off, it is very liable to be several minutes before the circuit breakers can be kept in, and the car got under motion again.

When it becomes necessary to reverse a car to prevent an accident, it is very liable to pull the circuit breakers out at a most critical moment.

I doubt if a too slow schedule decreases the number of accidents, as I have found out that on a division where cars run slow, the public are inclined to take dangerous risks, rushing in front of moving cars, that they will not take where the cars are moving at a brisk rate of speed.

To prevent accidents and increase the general efficiency of employés, select the employés scientifically and with care; provide a good system for your car inspection and have a surplus of power.

DISCUSSION.

President Rogers called upon Mr. Robinson to explain the system of instruction in vogue on the Metropolitan Street Railway lines:

Mr. Robinson: The Metropolitan Street Railway Company organized a club, the chief object of which was to educate the motormen and conductors, and held meetings, to which all other operatives of the company were invited. The president opened up a room in one of the depots, and during the last season, ending the first of May, there were a series of lectures held every two or three weeks. We had competent lecturers, the lectures being illustrated with appropriate stereopticon views, and the subject of underground trolley, cable machinery, cable apparatus, in fact, the general operations of the road were made plain by means of the photographic views. I think individual instruction is preferable to that received at the lectures, but the lectures are entertaining, and they have been largely attended by the working classes, I am glad to say. On the whole, they are considered very advantageous, and it is proposed to continue, and, in fact, enlarge them during the coming Winter.

President Rogers: Mr. Rossiter, do you not have a meeting once a week.

Mr. Rossiter: No, sir, we have not gone into that. We have rooms in our depots, but depend entirely on the instructors at the present time to turn the men over to the superintendents, competent to run the motors, and the superintendent is supposed to instruct them in regard to the details of each division, grade crossings, stops to be made at certain streets, etc. I was much interested in listening to the paper. I think it is an excellent suggestion. The only difficulty in the larger cities is in securing classes of men that are able to answer these questions. We furnish our men with rooms where they can secure papers, etc., and we have gone into the instruction and examination of the men closer than we ever did it before, with very beneficial results. I think the men take more interest in their work, and we are having less accidents, which shows an improvement in the class of men we are securing. I think only 15 or 16 motormen left the service of the company in the month of August; we have 1,600 of them, and, therefore, that is only one per cent. Some months we have had even less than that; out of 1,500 motormen, we have had less than six men that left the service in a month from all causes—dismissal and resignation. It shows the men are interested in their work, and glad to keep their places.

President Rogers called upon Mr. Fitch, of the Erie Railroad, to give his views on the question:

Mr. Fitch: We could not get along unless we had a system of examination of that kind. There has always been more or less examination on our train rules for several years, but since we have gone into the signal and other improved details, we have to examine our men thoroughly, and they must know these rules perfectly before they are competent to take charge of the train. On several of the divisions we have these schools of instruction. We appoint our road foreman, or our master mechanic, or train master, to take charge of the schools and instruct our men in their duties.

President Rogers called on Mr. C. D. Hammond, of the Delaware & Hudson Canal Company, to give his experience.

Mr. Hammond: We found it not only desirable, but absolutely essential, that we should have frequent examinations of our men of all grades as to their duties. We have, perhaps, a different method from some other roads. We do not examine our men in any set questions. I have always opposed any set questions to be asked employés. If we promote a fireman to be a locomotive engineer, he is directed to go to the man who is supposed to know most about the duties of a locomotive engineer, and that man takes him in charge and gives him a thorough investigation as to his knowledge of the duties of a locomotive engineer, and certifies to his ability, or otherwise, as it may be, before he is promoted. If he is to be a conductor, having served as a brakeman, he is sent before the assistant superintendent or train master and is examined by them. Such questions are asked as have been suggested to the examiner from time to time, growing out of errors or mistakes of men in performing their duties. I would be loath, indeed, to do away with our system of investigation.

A Gas Battery Experiment.

To the Editor of Electrical Review:

It is admitted, I believe, that the greatest question of modern times is the development of electrical energy direct from fuel. I will not say from heat, as I think it is conceded by most experimenters in this line that the best way to avoid the waste of heat in obtaining power or electricity from fuel is to make practically no heat at all.

Heat once generated from fuel generally passes up the chimney or draught to the extent of 50 per cent, and as most forms of combustion, causing combustibles to unite with oxygen, or air, necessitate a high temperature, the resulting gases pass into the atmosphere at a waste made greater or less by regenerative devices. At best, however, it is quite too large to raise any hopes of success.

We are thus driven to those chemical solutions of the matter which operate at ordinary temperatures—such, for instance, as the gas battery principle. We are confronted at the outset of this problem by the query: What shall we burn? When we burn carbon, such as carbonic oxide, we may employ a liquid, such as cupric chloride, which absorbs this gas, but we find that the C O_2, which is evolved as the product of combustion, mixes with the C O gas supplied and complicates matters. No gas heretofore used seems to offer any hope of complete success. I have, however, since last Winter, been experimenting with what I believe to be a practically untried gas for this purpose, and that is sulphureted hydrogen. Although I have not demonstrated its entire practicability for this purpose, I can still say that I have found it presents features that may render it valuable as a producer of electrical energy unequaled, to my knowledge, by any member of the gas family.

Before enumerating results let us consider the decomposition that is effected by passing a current through dilute sulphuric acid. After the current has passed a few minutes (the electrodes being of carbon) we find that, besides the evolution of oxygen and hydrogen, the anode smells quite strongly of ozone, and the cathode (especially if the solution is very strong) is observed to smell of sulphureted hydrogen. On disconnecting the battery and observing the return current (polarization), we find we have an initial potential of two volts from the carbons, which, if the latter are of good size, the current will last some time, although the voltage gradually drops. By trying the electrodes separately we find they have about one volt each.

As oxygen and hydrogen produce no practical results, and as it has not been found practicable to make large quantities of ozone, not to mention the drawback of its small solubility in water, we must turn our attention to the sulphureted hydrogen of the other electrode, or cathode, which latter we stated has an electro-motive force of one volt when freshly charged.

I find that, by impregnating a solution of dilute sulphuric acid with sulphureted hydrogen, the same electro-motive force of one volt can, under certain conditions, be obtained. A very simple way of showing the electro-motive force of sulphureted hydrogen is by heating a carbon on one end to a white heat and cooling the whole piece suddenly in water. On testing it with a neutral piece of carbon (the latter being surrounded by nitric acid in a porous cup), the electro-motive force is found to be one volt. This is occasioned by the hot carbon decomposing the water, and the latter's hydrogen, uniting with the sulphur of the coke, makes sulphureted hydrogen, which gas is imprisoned in the carbon by the water. It is evidently, then, the H_2S which gives the electro-motive force.

Another simple way of showing the electrical powers of sulphureted hydrogen is to place some strong ammonia in a porous cup, the latter being placed in a glass. On filling the glass with nitric acid (or a solution of potassium bichromate in sulphuric acid), and placing electrodes in both, a potential of about two thirds of a volt is observed, the same being an acid and alkali current. If the porous cup be now corked, and sulphureted hydrogen be fed into the ammonia through a hole in the cork until a saturated solution of ammonium sulphide is formed, an electro-motive force of one and two-thirds volt is produced, which, on short circuit, is reduced to about one and one-third volt. The additional volt, then, must be due to the sulphureted hydrogen. If the cup contains acidulated (H_2SO4) water instead of ammonia, a steady rise in electro-motive force takes place, on feeding in the H_2S, from zero to about two-thirds of a volt, when, the limit of saturation being reached, no higher voltage can be reached, unless the cup be corked up tight with a rubber cork and the gas introduced under high pressure.

The reason of this latter is obvious. One volume of water absorbing, at atmospheric pressure, only about three and one-half volumes of the H_2S, increased pressure increases this absorptive capacity, the liquid becomes richer with the gas and the voltage rises. It can not rise, however, above one volt, as this is about the electro-motive force of pure hydrogen. I have under pressure reached 27½–30 volts, when, at this point, a leak occurring in my apparatus, the voltage immediately dropped to 23–30. I find that this latter cell polarizes considerably on short circuit and rises on open circuit to one volt, which I account for by the fact that the H_2S solution is not strong enough. It should be strong enough to instantly counteract the influence of the layer of oxygen (and ozone) formed on the anode by the operation of the cell. If the H_2S solution is not strong, of course, this electrode will quickly polarize on short circuit. I find that soft carbons are best. In fact, soft coke cut to shape by a metal saw is about the best material, as it possesses a large surface for collecting the gas from the water.

There does not seem to be any reasonable doubt but that a good practical current can be obtained under pressure from this gas, provided the pressure be high enough. The gas liquefies at 257 pounds, but I scarcely think such a high pressure is necessary, but, of course, it puts much power in a very small space.

For depolizer, nitric acid or chlorine under pressure, or possibly air, etc., may be used. The advantages of sulphureted hydrogen appear to be its solubility in water and its high electro-motive force. (No electro-positive gas can possibly have a higher electro-motive force than that of sulphureted hydrogen, for, being one volt, it is equal to that of pure hydrogen.) The fact that the oxidization of it produces only liquids (evolving no gases), such as water, sulphurous and sulphuric acid is possibly one of the greatest points in its favor. The sulphurous acid, of course, becomes sulphuric acid.

I have not examined this latter part very closely, but the main products of oxidization seem to be water and free powdered sulphur. Finally, to sum up all, there does not appear to be any great difficulty in producing commercial currents on a large scale from this gas, provided it can be manufactured cheaply enough, as it ought to be, by heating together sulphur and grease, the sulphur (as is well known in this method) extracting the hydrogen and leaving the carbon, which latter might be used in heating the retorts. The sulphur collected from the anode cups may be used over and over again; or, some variation of the water gas process may be used, sulphureting the hydrogen at high temperature, etc. The odor of the gas need not be an objection, as it is used in closed tanks, and the odor of ordinary coal gas is not pleasant, either, for that matter.

In case any one cares to try the experiment, I will add that the only apparatus needed is a tight steel vessel (waxed on the inside), containing a porous cup appropriately fitted up with electrodes, etc. The depolarizer ought to be placed in the inside cup (porous cup) and the gas under pressure admitted to the outer vessel, which latter contains the dilute sulphuric acid. The pressure thus coming on the outside of the porous cup has no great tendency to break the same, especially if the latter is corked tight, so that a very little fluid can enter it by reason of the resisting pressure thus created within, or breakage can also be avoided by pumping in depolarizing liquids or gases under pressure to the interior cup.

The action which takes place between ammonium sulphide and any depolarizing electrolyte, such as nitric acid, is quite energetic, but can hardly be economical, as the acid depolarizer converts the sulphide into salts without producing much current, and, while much sulphur is precipitated, and, therefore, is not all lost, still the employment of the H_2S gas alone under pressure seems to promise to be more economical. There should be no alkali in the cell, as the oxidization of the H_2S naturally produces probably some sulphuric acid which neutralizes (at a waste of power) the alkali. If much sulphuric acid is produced, it might be deprived of its oxygen by passing it over red-hot coke and thus reducing it to H_2S again.

The simplicity of the process, as I have thus far developed it, seems another great point in its favor. The fact that such a low resisting liquid as dilute sulphuric acid can be used as a positive electrolyte, is a good point also.

In regard to the general economy of thus using H_2S in a cell, I unfortunately have no exact data one way or another, such a testing process requiring accurate apparatus, such as I have not the time at my command to construct and operate. I only present the idea in the hope that some of your readers may be interested in this as a possible solution of the long considered problem of cheaper currents.

Experiments, sometimes comparatively unimportant in themselves, frequently open up the way for demonstrations to greater usefulness. My only regret in regard to this process has been that I could not get the time to more fully ascertain its strong or weak points.

J. R. Payson, Jr.

Oak Park, Ill.

ELECTRIC LIGHT FLASHES.

The Edison Electric Light Company of Philadelphia, Pa., will make extensive alterations to its building on Sansom street, above Ninth. The cost of the improvement will be $5,000.

The new West End Hotel is equipped with the largest and practically the only isolated electric light plant ever installed in Portland, Me. The plant was put in by the Belknap Motor Company, of Portland.

The Sherbrooke, P. Q., Gas and Water Company are expending a large amount of money in improving their property at the electric light station. The directors are sparing no expense in providing the best possible plant for electric lighting.

Some highly interesting experiments in the development of plants by the electric light have been concluded by the Cornell department of horticulture, at Mobile, Ala. By using electric light during the daytime, Professor Bailey produced lillies fully two weeks before the plants grown under natural conditions flowered.

The county commissioners have contracted with the Edison Electric Illuminating Company of Baltimore City, Md., to light with electric arc lights some of the streets, highways and lanes of Baltimore County for a period of five years at 35 cents per night for each light. The lamps are to be 2,000 candle-power each and will burn all night.

An injunction has been granted by Justice McLennan, at Syracuse, restraining the village of Mohawk, N. Y., from proceeding further to establish an electric light plant. It appears that there is a statute which provides that in case municipal control of an electric light or gas plant is proposed, the municipality must buy out the existing companies. This, it appears, the village of Mohawk has not done nor proposed to do.

OUR CANADIAN LETTER.

TORONTO, ONT.—A Toronto-Hamilton trolley line is among the possibilities of the near future.

ST. THOMAS ONT.—Negotiations are pending for the sale of the St. Thomas Street Railway to a Cleveland company.

LISTOWELL, ONT.—Tenders will be asked shortly for installing an electric light plant in this town.

HUNTSVILLE, ONT.—The City Council has passed a by-law in favor of putting up an electric lighting plant.

GRANBY QUE.—Adamsville, East Farnham and Farnham Centre will join Granby in erecting a street lighting system.

HAMILTON, ONT.—The new radial line from Hamilton to Ancaster has been granted a free right of way through the latter municipality.

NIAGARA FALLS.—The Niagara Falls Power Company have contracted for additions to their premises and plant to cost $3,000,000, for the purpose of furnishing power to Buffalo, N. Y.

MEAFORD, ONT.—A by-law has been passed to authorize the Huron & Ontario Railway Company to construct, equip and maintain a line of railway through the various streets within the limits of the corporation of Meaford.

PERTH, ONT.—The time for beginning the construction of the Perth & Lanark Electric Railway has been extended one year by the Perth Town Council, provided satisfactory guarantees of good faith are given on behalf of the company.

LONDON, ONT.—The local street railway company are gainers to the extent of from $12,000 to $15,000 by the recent decision of the Privy Council of England allowing the Toronto Street Railway Company a remission of the duties paid on imported steel rails.

ST. REMI, QUE.—The manager of the Paré & Paré Telephone Company has concluded the purchase of the Richelieu Telephone Company. This line runs from St. Remi to St. Guillaume, Que., and connecting lines, making 262 miles of trunk lines with 47 towns and villages connected together.

AMHERSTBURG, ONT.—The Amherstburg Electric Light, Heat and Power Company, Limited, applies for incorporation; capital, $20,000. The applicants are Messrs. W. H. McEvoy, Amherstburg; F. C. Armstrong, Toronto; J. J. Ashworth, Toronto; Nary. A. McEvoy, Amherstburg; Nary. A. Kane, Amherstburg.

MONTREAL, QUE.—At the annual meeting of the Canadian Electric Light Company the following gentlemen were re-elected directors: R. McLeman, president; Adolphe Davis, vice-president; Henry Hogan, R. Bickerdike, J. D. McLeman, Cleveland, Ohio; O. C. Claggeth and F. S. McLeman, secretary-treasurer.

MONTREAL, QUE.—Another important step towards the completion of the work of harnessing the Lachine Rapids, and bringing cheap light and cheap power into the city, took place on Saturday, September 12, when about 800 most prominent citizens of Montreal and vicinity attended the ceremony of laying the corner-stone of the main dam and power house of the Lachine Hydraulic and Land Company. The works had been gayly decorated for the occasion. The band of the Sixth Fusiliers was in attendance. Among those present were Messrs. E. McQuirde, New York; J. B. Fraser, Ottawa; Dr. Ami, Ottawa; Jas. Davis, Cornwall; Seybold, Ottawa; John Yes, Prince Edward Island; Messrs. Coleman, New York, and others. Addresses were delivered by Messrs. W. McLea Walbank, C. E.; G. B. Burland, president of the company; Sir William Hingston, M. D.; John Crawford, Hon. Louis Beaubien and W. McKay.

QUEBEC, QUE.—A company of Quebec capitalists is in the process of formation to take over the franchise of Mr. Beemer and construct the electric railway. The capital necessary for this purpose for the equipment of the road is estimated by Mr. Badger, who has charge of obtaining subscriptions, at $400,000, and among those who have already subscribed are the following: E. J. Price, $25,000; E. E. Webb, $20,000; T. H. Dunn, $20,000; A. Breakey, $20,000; F. W. Ross, $20,000; A. Thompson, $10,000; E. M. Methot, $10,000; E. Shraples, $10,000; G. T. Davie, $10,000. It is the intention of the promoters to put between 400 and 500 men on the work at once, to equip and put in operation the lower town section as far as the St. Valier tollgate this Fall, and to keep the cars running during the Winter. The line from Champlain street along Dalhousie street is the section of the Quebec Street Railway which will first be constructed. The rails are now on their way to Canada.

J. A. C.

Montreal, Sept. 18.

The Copper Market.

A prominent local copper operator recently returned from Europe says that, in his opinion, the copper market has reached the lowest point that it will touch in a very long time. The electrical development in Europe during the past year has been something marvelous and the demand for copper from that quarter, even now very heavy, is likely to increase rather than to fall off.

He points out the fact also that all the large American producers are now sold well ahead and that domestic consumers are at present running on short supplies, hoping soon to be able to buy at lower figures. He predicts that they will be sorely disappointed and expresses the belief that, once a general revival in business is inaugurated, the copper market will advance more sharply than it has in several years.—*Boston News Bureau.*

The extension of the electric plant and the installation of the new ventilating scheme adopted for the United States Senate chamber, Washington, D. C., are progressing at the Capitol with all due speed. Electric lights have been inserted in the cornice of the small rotunda under the great dome. The cost of the improvements and repairs at the Capitol will amount to almost $100,000.

The Imaginative Telephone Subscriber.

While we are not intending to open our columns to the various electrical poets of the day, there is not a telephone operator in the country who reads the REVIEW but who will appreciate the following communication and the accompanying rhythmical attempt. There are numerous telephone subscribers who, like the old innkeeper in "The Bells," are constantly hearing the ringing of the bells when no bells are rung. The attempt on the part of the operator to relieve her feelings by an ode, should not call for too much censure—the exasperation was great, no doubt:

TO THE EDITOR OF ELECTRICAL REVIEW:

The inclosed "ode" was written by one of our operators, who has had considerable experience with "Tom," whom, she says, declares many times a day that some one has called 908, when in reality there has been no call. "Tom" has charge of a baggage express, and there are times during the day when he is rushed, and the telephone seems to cause him no end of trouble. If you care for this you can publish it. W. L. B.

Syracuse, N. Y.

THE ODE.

The girls in the office are all quite serene
'Till Tom Pike's number to drop is seen;
For late and early, and early and late,
We hear "Who called number 908?"

Now, it happens each Sunday when many good folks
Are enjoying divine service, and others a smoke,
All things are peaceful, when, oh, cruel fate,
We hear Tom's gentle tones, "Who called 908?"

Then the sweet, gentle creature at the other end of the 'phone
Tears her hair in her anguish, but with sweet pleading tone,
"I am sorry indeed, it must be a mistake;
I can not find out who called 908."

Then up in the "Central" is war to the teeth,
"Tom" yells in his madness, "let me talk to the Chief:
For I know you darn girls are working a fake,
And playing the devil with 908."

(By a SYRACUSE TELEPHONE OPERATOR.)

Municipal Lighting in New England.

The cost of municipal lighting in several New England cities is compiled as follows:

New Haven, Ct., 408 lights, $98.55, all night; Stamford, Ct., 169 lights, $125, all night; Taunton, 108 lights, $125, 1 a. m.; Lawrence, 98 lights, $100, all night; Pittsfield, 61 lights, $95, all night; Derby, Ct., 45 lights, $60, midnight; Danbury, Ct., 117 lights, $84.61, 1 a. m., except moonlight; Manchester, N. H., 424 lights, $115, all night: Danielson, Ct., 44 lights, $75, midnight; Boston, 2,530 lights, $127.77, all night; Westbrook, 35 lights, $100, all night; Newport, R. I., 100 lights, $167.90, all night; Hartford, Ct., 627 lights, $79.20, all night; Natick, 20 lights, $81, 3 a.m.; Holyoke, 147 lights, $100, all night; Marlboro, 56 lights, $90, 1 a. m.; Rockland, 51 lights, $61, all night, 300 nights; Putnam, Ct., 36 lights, $75, midnight; Northampton, 160 lights, midnight, and 20 all night, except moonlight evenings, $67.50.

Bowling Green, Ohio, Electric Light and Power Company has begun business with its new plant. It is one of the best equipped establishments of the kind in the country, containing the most modern electrical machinery. It is from this plant that power will be supplied for the new Toledo, Bowling Green & Fremont Electric Railway.

Telegraphing the Chinese Language.

All the principal cities of China are now connected with one another and with Peking, the capital, by telegraph. Recent visitors to China say, however, that telegraphing there is a laborious and expensive process, and that the lines are a charge upon the State treasury instead of a source of revenue.

The dispatches are, of course, sent in Chinese, for not one in many thousands of the natives knows any language except his own. But the Chinese have no alphabet. Their literary characters, partly ideographic, partly phonetic, number many thousands. It is simply impossible to invent telegraphic signals that would cover the written language. Here was an obstacle in the way of using the telegraph at all.

The difficulty was obviated, says a writer in the San Francisco *Chronicle*, by inventing a telegraphic signal for each of the cardinal numbers, and so numbers or figures might be telegraphed to any extent. Then a code dictionary was prepared, in which each number, from one up to several thousand, stood for a particular Chinese letter or ideograph. It is, in fact, a cipher system. The sender of the message need not bother himself about its meaning. He may telegraph all day without the slightest idea of the information he is sending, for he transmits only numerals.

It is very different with his friend, the receiver. He has the code dictionary at his elbow, and after each message is received he must translate it, writing each literary character in place of the numeral that stands for it. Only about an eighth of the words in the written language appear in the code, but there are enough of them for all practical purposes.

But the Chinese system has its great disadvantages. Men of ordinary education have not sufficient acquaintance with the written language to be competent receivers, and the literati are not seeking employment in telegraph offices. So the government recruits its employés with much difficulty. There are almost no Chinese who have business relations all over the country, as is the case with many thousands of our business men. The public is not invited to buy stock in the Chinese telegraph lines, and if it were, nobody at present would buy with a view to dividends. The receipts do not equal the expenses, and the government makes up the deficit.

There is another great disadvantage of the Chinese telegraph system. All over the world the movement of railroad trains is regulated by telegraph. The orders received by the station agent are filed in plain view of the employés, and, if need be, the switchman may take temporary charge and carry out the instructions from the central office.

Railroads have been introduced into China to a very small extent, and there is talk of greatly extending the service. But how about running the trains?

Presidency of a Washington Street Railway.

Associate Editor Harries, of the Washington *Star* is said to be slated for the presidency of the Metropolitan Street Railway Company, of Washington, D. C., in place of Mr. Samuel Phillips who lately resigned that office. Mr. Harries has done some splendid newspaper work for the *Star* as a reporter. His correspondence during the recent Indian outbreaks in the West was very interesting and accurate. His work during the Homestead, Pa., strike a few years ago brought him into conflict with a number of strikers who endeavored to intimidate him into suppressing the reliable news he had been sending. Mr. Harries appealed to the manhood of the strikers and succeeded in sending his dispatches.

Mr. Albert A. Wilson, Marshal for the District of Columbia and an intimate personal friend of President Cleveland, has been vice-president of the Metropolitan Street Railway Company for several years, and is understood to be a candidate for the presidency. The majority of the directors of the road, however, are said to favor Mr. Harries.

Mr. Phillips's retirement from the head of the road is rumored to have been due to his attitude toward labor organizations, which did not meet the approval of the directors.

Mayor Brown, of Rockford, Ill., has just compiled a schedule showing the prices paid by 250 of the largest cities in the United States for municipal electric lighting, which shows that Rockford is the cheapest lighted city in the country. Under the new system the city pays $52 per arc lamp per year, burning all night, and has 362 lights, while no other city in the country of 30,000 has over 250 lamps.

Major McKinley and the Telegraphers.

A large number of the telegraphers, of Chicago, visited Major Wm. McKinley, at Canton, Ohio, September 19. The Republican candidate addressed them very happily as follows:

"Perhaps none of us appreciates the degree of universal acceptance that the telegraph has obtained. I remember as a boy of reading how Morse, the first to put the telegraph into practical use in the United States, sent his first greeting across the wires—the significant message: 'What hath God wrought?' Little did the people know then what a gift he had made to his future countrymen and to the remotest ages. [Applause.]

"When the Democratic National Convention in 1844 was in session at Baltimore, it is said the news of Mr. Polk's nomination was instantly telegraphed to Washington, 60 miles distant, but it found no credence there. Men did not believe in the accuracy of the statement, and waited until it was verified by the newspapers or the returning delegates. [Laughter and applause.] Perhaps the news was surprising where a different result was so confidently expected, but it illustrates the credulity of the times and the lack of confidence in scientific accuracy.

"Contrast this lack of faith with the story of the old man who, it is reported, had learned to read the clickings of the wires, waited patiently at the telegraph office in Chicago for many hours for news from Appomattox, and when at last the wires were clicking the news from Washington that Lee had surrendered, he sprang to his feet with the happy exclamation, which proved to be his last words—'And now I can die happy.' [Great cheering.]

"Congress gave very scant aid to the great invention, and some of the old statesmen of that time laughed to scorn a proposition to make a small appropriation for connecting Washington and Baltimore by a telegraph line, saying it was chimerical and could not be done [laughter], and yet they lived to see such lines practically girdle the globe. [Applause.] American genius and enterprise, wiser than the law givers, was soon extending wires everywhere, until now I believe it is estimated that the American lines extend for 250,000 miles, with 800,000 miles of wire, 26,000 offices, and 42,000 employees. Everywhere the service is efficient and reliable [great cheering], and I congratulate the telegraphers of Chicago, as the representatives of those of the entire country, upon the marvelous skill, rapidity and accuracy with which the millions of messages almost daily are handled and transmitted. [Applause.]

"It is gratifying, too, to find them as sensible in politics as in business [great applause], as quick to enhance the prosperity of the country, and as unitedly in support of the right as they are uniformly attentive and obliging to the public. [Great cheering.]

"I thank you, my fellow citizens, for your call, and appreciate most highly indeed your assurances of support which your eloquent spokesman has presented to me. I wish I could shake hands with every man in this audience. [Cries of 'We wish you could, too, Major.'] I do not know that I can do it, but I am glad to meet and greet you, and am glad to know that you are enlisted in the great cause as against public repudiation. [Tremendous cheering.]

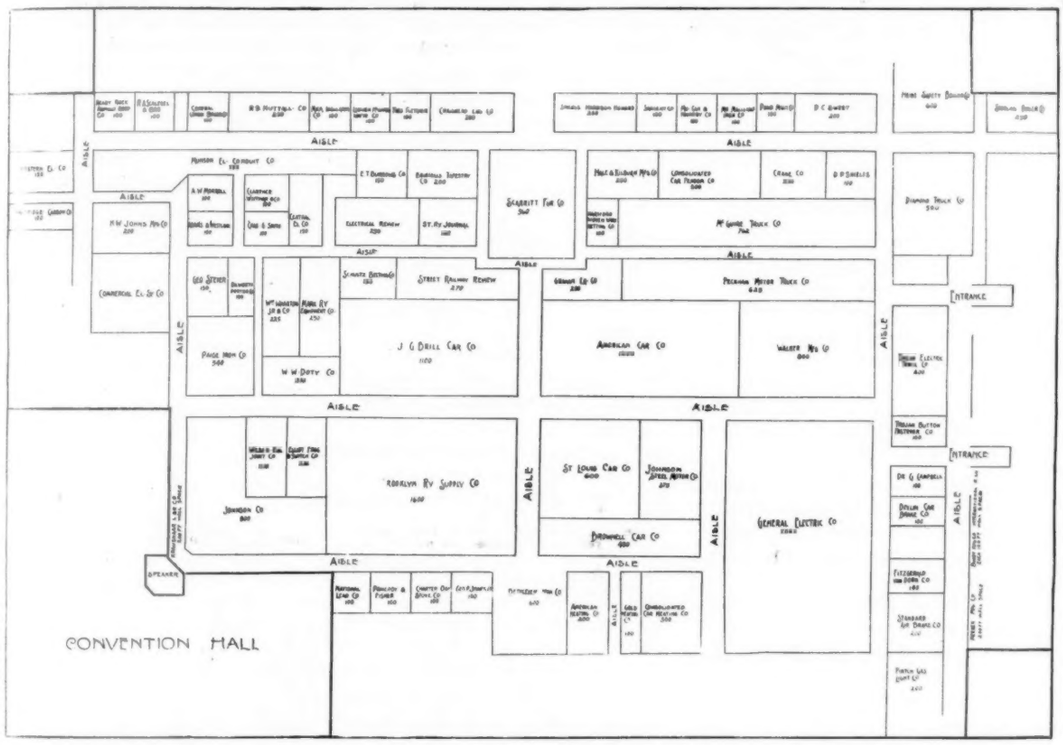

Diagram Showing Allotment of Exhibit Space at St. Louis Convention of American Street Railway Association, October 20-23, 1896.

The Exhibitors at the Street Railway Convention.

It is evident that there will be a greater number of exhibitors at the next convention of the American Street Railway Association at St. Louis than was ever present at any of these meetings. A diagram of the main exhibition hall is presented in this issue, and we are indebted to the courtesy of our contemporary, the *Street Railway Review*, of Chicago, for the use of this illustration.

At the headquarters of the Electrical Review, which, it will be seen, are extensive and well located, will be extended a welcome during the convention to all visitors.

The Old Timers.

The Old Time Telegraphers' Association of the United States held its annual meeting in Pittsburgh recently and was well attended. Mr. S. A. Duncan presided.

The association elected the following officers:

President, J. Compton, superintendent Western Union, Nashville; vice-president, Martin Barth, Westmoreland.

Executive committee: K. McKenzie, Jackson; E. Howard, Memphis; A. M. Pennock, Chattanooga; J. B. Watt, Nashville; James Galvin, Edgefield Junction.

Mrs. Martha J. Cragin, in sending her application for membership, writes:

In 1863 I was in Carlisle, Pa. In the Spring of that year a lad of 13 called on me in regard to learning telegraphy. He was then studying at the academy and about to graduate in three months, and leave Carlisle. I told him the time was far too short for him to become a sound operator and discouraged him all I could. He was disappointed, and said he was anxious to make the attempt. Finding he was well supplied with ambition, I consented to give him a trial, and in just three months he became a good, sound operator, and graduated from the academy with high honors, and was the valedictorian of his class, and, a few months later, secured a position with the telegraph company at Pittsburgh. I am very pleased to state that the said lad is now the honored president of the Old Time Telegraphers' Association, Mr. Samuel A. Duncan.

The period spoken of in the application by Mr. Duncan's tutor in the Summer of 1863 and 1864 was when the rebels raided the Cumberland Valley, and when the operators of both companies—the United States and the Western Union—left their posts.

The next convention will be held in Nashville.

The United States Military Corps of Telegraph Operators met and transacted their regular routine of business.

BOOK NOTICES.

We have received "Consular Reports" for September, 1896, and the "Report of the Commissioner of Education, 1893-94," from Washington.

The eighth "Annual Report of the Department of Public Safety," of Pittsburgh, for the year 1895, has been sent to the Electrical Review by Mr. Morris W. Mead, superintendent of the Bureau of Electricity. It is a volume of nearly 900 pages, and is a very complete and valuable publication; a model in its line.

"The Naval Weakness of the United States" forms the subject of an article of commanding interest in the October number of *Cassier's Magazine*. It was written by William Ledyard Cathcart, formerly of the Engineer Corps of the United States Navy, and deals with naval abuses and political chicanery little dreamed of by the people. Reading it will afford a lesson of grave interest and importance on both sides of the Atlantic.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Electric Railways.

BALTIMORE, MD.—The Falls Road Electric Railroad Company, Wallace King, has written a letter to commissioners of Baltimore County, protesting against the latter's refusal to grant permit for construction to the company until taxes of the Pikesville, Reistertown & Emory Grove Railroad are paid. Mr. King said that the two corporations are separate, and one should not be held responsible for the debts of the other.

ST. PAUL, MINN.—E. E. McDonald and others have asked for franchise to construct an electric railway to Superior. Objection to the ordinances is that freight cars will run through the city. Promoters of the enterprise promise to open new territory that should be tributary to St. Paul.

NORTH ADAMS, MASS.—Work has commenced on the Beaver extension of the electric road.

WARSAW, IND.—Capitalists of Warsaw and Fort Wayne are organizing a company to build a trolley line from Winona to Warsaw.

MOUNT WACHUSETT, MASS.—A. L. Kneeland, of Worcester, has organized a company to build an electric street railway to this place. Articles of association have been filed for the concern, which is to be called the Westminster Street Railway Company. The company is to be capitalized at $100,000. The directors are: D. C. Miles, William Mayo, F. A. Merriam, Artemus Merriam, P. P. Ellis and S. F. Lamb, of Westminster; W. B. Ferguson, of Malden; W. E. Putney, Wachusett, and George H. Mellen, of Worcester.

DERBY, CT.—A trolley line will probably be constructed to Bridgeport.

WATERBURY, CT.—The Traction company will hold meeting concerning extension of trolley line.

MILFORD, MASS.—An electric road is to be constructed from Fitchburg to Gardner, with a branch to Lake Wachusett. The sum of $100,000 has been subscribed.

ST. LOUIS, MO.—Surveys of the proposed Ferguson Electric Railroad are being made.

SUFFIELD, CT.—Steps are being taken to construct an electric road from Springfield to Windsor Locks.

EAST BRIDGEWATER, MASS.—George J. Morse is interested in the construction of an electrical street railway, which will connect with Brockton.

MANCHESTER, N. H.—Mayor Clark may give information concerning extension of street railway company's line.

WALKERTON, ONT.—Mr. A. Brunel, engineer of the Huron & Ontario Electric Railway, has presented his report on the route. A number of waterfalls are to be utilized for power purposes, and several bridges will be erected over the Saugeen and other streams.

SHELBOURNE FALLS, MASS.—The Shelbourne Falls & Colerain Electric Road is expected to be in operation October 1.

CONWAY, MASS.—Work is progressing rapidly on the extension of the electric road across the river to connect with the Fitchburg Railroad, and the company expect to extend their line to Ashfield this Fall, a distance of five miles, and no doubt bids will soon be called for.

Electric Light and Power.

CARTHAGE, MO.—City Clerk may give information concerning proposed municipal electric light plant.

ATHENS, ALA.—Steps are being taken to construct electric light plant.

JASPER, IND.—The Jasper Electric Light Company has been awarded a franchise to construct a plant in this city.

GEORGETOWN, MASS.—Step are being taken to form an electric light company at this place.

AUGUSTA, GA.—An effort is being made to establish a new electric light plant at this place. Mr. E. A. Sweet is the projector of the enterprise.

BARRE, MASS.—An electric light plant is to be established, and also an electric road from the station to the Center.

CHATFIELD, MINN.—C. R. Madison is interested in the electric light plant which is to be established.

BRUNSWICK, GA.—J. B. Abrams is interested in construction of an electric light plant.

SHREVEPORT, PA.—The Mayor may be addressed concerning establishment of an electric light plant in market house.

FERGUSON, MO.—The Olive Branch Electric Light and Supply Company contemplates erecting a duplicate plant.

NORFOLK, VA.—The Monticello Realty Company, D. Lowenberg, president, is in the market for an electric plant for hotel.

BENICIA, CAL.—The Solano Electric Light and Gas Company have asked for a franchise.

CRESCENT CITY, FLA.—An electric light plant is to be established.

COLUMBUS, OHIO—The contract for a small electric light plant at the east side pumping station of the waterworks was awarded to the Thresher company.

WILMINGTON, VT.—Joseph Courtemanche will enlarge his electric plant this Fall and put in a new engine.

New Construction Companies.

NEW YORK, N. Y.—Geo. B. Inman Contract Company has been incorporated by Geo. B. Inman and Edwin L. Hunt, of New York city, and Geo. Frohl, of Brooklyn, to contract for the construction of waterworks, gas and electric light works, electric railroad, etc. Capital stock, $10,000.

New Manufacturing Companies.

TROY, N. Y.—The Edwards Car Coupler Company has been incorporated to manufacture mechanical devices of every kind and description which may be placed upon, operated or used in connection with locomotives, cars and vehicles propelled by steam, electricity or other motive power; capital, $500,000. Directors: Richard J. Edwards, Galena, Ill.; Charles E. Lewis, Philadelphia; Charles H. Wallow and John A. MacDonald, Troy; Merton A. Holdridge and Lyman P. Wood, Green Island, N. Y., and Howard C. North, of Watervliet, N. Y.

ALBANY, N. Y.—The Ajax Electric Company has been incorporated by T. C. Roberts Horsfield, Arthur S. Willdig and W. D. Spellman, of Brooklyn, for the manufacture of studs, hooks and electrical appliances. Capital stock, $50,000.

New Telephone and Telegraph Companies.

GENEVA, N. Y.—A franchise has been granted to Thomas H. Chen and J. L. Bennett to establish a new telephone company at this place.

NILES, MICH.—The Gilliland Telephone Company, of this city, and the Central Telephone Company, of South Bend, Ind., have combined and will connect a circuit of Michigan and Indiana cities with telephones in competition with the Bell company.

ROCKWOOD, MICH.—A telephone line is to be put up between this place, Flat Rock, Carleton, Waltz, Willow and New Boston.

SYRACUSE, N. Y.—The Common Council has granted telephone, subway and electric light franchises to Eugene Hughes & Company, of this city.

MONROE, MICH.—A company composed of Carleton, Flat Rock, Waltz and Rockwood capitalists has been organized to construct a telephone system to connect the above named points. Work will begin at once.

NEW HAVEN, CT.—A State branch of the Franklin Telephone Company has been organized in this city, and articles of incorporation have been filed. Both local and long-distance service are to be rendered.

Business Troubles.

FORT WAYNE, IND.—The Consolidated Electric Railway Company has passed into the hands of a receiver. The company is capitalized at $2,000,000.

Increase of Capital.

SPRINGFIELD, MASS.—The Springfield Street Railway Company will increase its capital stock to $1,200,000.

The Kearny Electric Light and Power Company.

In February, 1895, the Kearney Electric Light and Power Company was incorporated. The plant is situated along the river road, one mile from Kearny, N. J. The company furnishes 50 arc lights, 1,200 incandescent lights, and has a capacity for 240 arc lights and 1,800 incandescent lights. This company now operates one Ball engine, cross-compound, 250 horse-power; two Thomson-Houston dynamos of 50 arc lights each; two Standard of 60 arc lights each; one Standard alternator of 1,500 incandescent capacity and extra armature for each; four steel boilers of Coatesville Boiler Company, with condenser, heater, feed pump, injectors, and everything necessary for operating a plant economically. The long-standing opposition company to the Kearny company has sold its plant to the People's Electric Company, of Newark, N. J., which cuts off the long fight in which the company has been engaged since the starting of the Kearny Electric Light and Power Company. The property was constructed by George F. Woolston, who built the Snake Hill plant for Hudson County, and who has also constructed electric railway and lighting plants and waterworks at different places throughout the United States, to the amount of over $4,000,000. Mr. Woolston has consummated arrangements with financiers in Boston, who have backed him largely in the past, for sufficient funds to greatly increase the capacity of the Kearny plant by adding dynamos, engines and other machinery. The present owners of the Kearny company, together with their eastern associates, are of the opinion that there is no better field for a lighting company than the one in which they are located. The company expects to be active bidders for all lighting contracts in this region from now on. In the near future this company will apply to the city of Newark, N. J., for the right to erect a pole line for private and public lighting, and, in short, expect to have their share of both in the territory. The location of the Kearny plant is favorable for producing electricity as cheap as it is possible to make it. They float coal in cargoes of from 300 to 500 tons to their plant at a cost of less than $2 per ton, and there is no expense for carting of either coal or ashes. The company owns a valuable dockage. The present territories lighted by the Kearny Electric Light and Power Company are East Newark, Kearny, Arlington and Belleville. The gross income at the end of the first year's business was $18,000 and there is no reason why it should not be quadrupled within a reasonably short time. The owners of the property are active in the details of its operation and thoroughly understand all branches of the business, both mechanical and electrical. The necessary repairs to machinery and armature windings are done on the premises. The Kearny company stands in the front rank for low percentage of operating expenses. There appears to be no reason why the Kearny Electric Light and Power Company should not become a prominent factor in the lighting and power business of eastern New Jersey.

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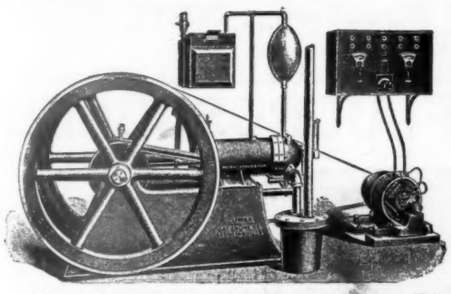

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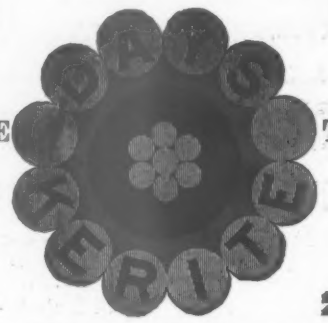

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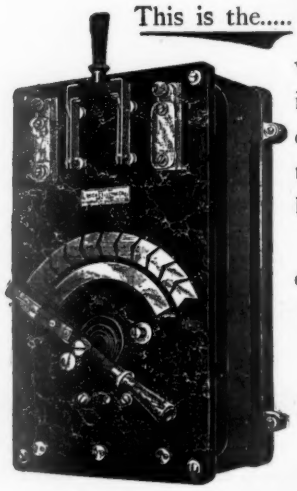

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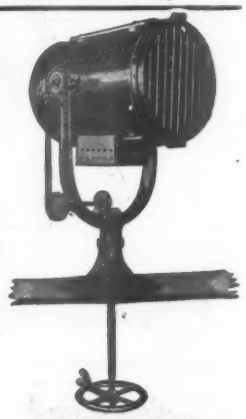

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